Math 2313, Final

Name _____

1. Find a vector parallel to both of the planes $2x - z = 0$ and $y + z = 3$.

   answer: $(1, -2, 2)$

2. Find the equation of the tangent plane to the surface $x^2+3y^2+2z^2 = 21$ at $(1, 2, 2)$.

   answer: $2x + 12y + 8z = 42$

3. *Use the chain rule* to find $\frac{\partial U}{\partial p}$ at $p = 1, q = 1$, if
   $U = x^3 + ln(xy) + e^{3yz}$
   $x = pq$
   $y = q/p$
   $z = p^2 - q^2$

   answer: 9

4. Evaluate $\int_0^2 \int_{-\sqrt{4-x^2}}^{\sqrt{4-x^2}} 2e^{x^2+y^2} dydx$

   answer: $\pi(e^4 - 1)$

5. Find the directional derivative of $f(x, y, z) = x^3 + ln(xy) + e^{3yz}$ at the point $(1, 1, 0)$ in the direction of the vector $< 1, 1, -1 >$.

answer: $\frac{2}{\sqrt{3}}$

6. Find the point on the surface $z = \sqrt{x^2 + 5y^2}$ closest to the point $(1, 1, 0)$.

answer: $(\frac{1}{2}, \frac{1}{6}, \sqrt{\frac{7}{18}})$

7. Write an integral which, if evaluated (but don't evaluate), would give the mass of the tetrahedron in the first octant under the plane $4x + 2y + z = 12$, if the density is given by $\rho(x, y, z) = xyz$.

answer: $\int_0^3 \int_0^{6-2x} \int_0^{12-4x-2y} xyz \; dzdydx$